

Scottish Affairs Committee

Oral evidence: [The future of the oil and gas industry](#)
[, HC 996](#)

Monday 25 June 2018, Aberdeen

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Members present: Pete Wishart (Chair); Deidre Brock; David Duguid; Hugh Gaffney; Christine Jardine; Ged Killen; John Lamont; Danielle Rowley; Ross Thomson.

Questions 86 - 116

Witnesses

[I:](#) Colette Cohen, CEO, Oil & Gas Technology Centre; Professor Paul de Leeuw, Director, Oil and Gas Institute, Robert Gordon University; Professor Alex Kemp, Professor of Petroleum Economics, University of Aberdeen, and Director, Aberdeen Centre for Research in Energy Economics and Finance; and Willie Reid, Director, Strathclyde Oil and Gas Institute.

Written evidence from witnesses:

– [Professor Alex Kemp](#)

Examination of witnesses

Colette Cohen, Professor Paul de Leeuw, Professor Alex Kemp and Willie Reid.

Q86 **Chair:** Welcome to the Scottish Affairs Committee as part of our evidence session and our inquiry into oil and gas in Scotland. We are very grateful to the Oil & Gas Technology Centre for hosting us this morning. Thank you, Ms Cohen, for the nice invitation to come. Just for our record, who you are, who you represent and anything by way of a short introductory statement. We will start with Professor Kemp.

Professor Kemp: I am Professor Alex Kemp. I am Professor of Petroleum Economics at the University of Aberdeen. I have studied the subject of North Sea economics for many years. My opening statement is not revolutionary at all: that is that we have to acknowledge that the North Sea is now a mature petroleum province. There is significant remaining potential, but it is not easy to fully exploit and the challenge is to find the appropriate technologies and regulatory framework that will maximise the economic recovery.

Colette Cohen: I am Colette Cohen. I am the CEO of the Oil & Gas Technology Centre. I am grateful that you could all join us here today and use this facility. Mainly it is great for us to showcase this facility, because it is part of the continuous investment by both the UK and Scottish Governments in the future of the oil and gas industry.

As part of my statement, I would like to say that while the industry has done a huge amount over the last few years in making itself competitive and driving down costs, what we have identified now to make it sustainable is that technology is required. An organisation like ours really becomes a catalyst for that partnership between Government and industry to deliver a step change for the future of the oil and gas industry. I hope that we can maybe explore that a little bit more today.

Professor de Leeuw: My name is Paul de Leeuw; it is great to be here this morning. I have over 30 years' experience in the oil and gas industry, predominantly working for the operator community. I now work at Robert Gordon University and I run the Oil & Gas Institute, but I wear a number of different hats as well. I am on the board of the Oil & Gas Technology Centre; I am the chair of the Oil & Gas Innovation Centre, a Scottish Government initiative; and I also am a regular commentator on the industry and adviser to many countries' Governments and other organisations.

My key opening message here is we have had 50 years in this industry and made enormous progress. I think the next so many decades are going to have a very different look and feel and shape. I think collectively we can create an incredibly powerful North Sea, but it requires a different way of thinking, different ways of working and certainly new technology and innovation. Exciting years ahead, but we are going to have to collectively make it work.



HOUSE OF COMMONS

Willie Reid: My name is Willie Reid. I am Director of the University of Strathclyde Oil & Gas Institute. Like Paul, I have more than 30 years' experience in the oil and gas industry. I am very pleased to be invited here.

Just by way of a comment, the University of Strathclyde is very pleased to participate in this industry and has done so for the last two or three years, involved with the OGA and OGTC and others. We are very pleased about that, but my key message is that whereas MER is up and running and we have a good tax and fiscal regime in place, the key issue now is for the technology aspect of the supply chain to be invested in and developed so that we can get exports and develop the domestic industry. Technology will play a big part in that and I think that the oil and gas sector deal will as well.

Q87 **Chair:** We are grateful. I just want to check that everybody in the Committee can hear fine; there is an odd frequency. If I could maybe ask you to speak up a little bit—I know you are just across the table from us—if that would be all right. I have also just recognised that I think we have over 100 years' experience in the oil and gas industry sitting across the table, so I will just start with an opening question about your view about where we are exactly.

Obviously we have been through the downturn and there does seem to be renewed confidence returning to the sector. What is your view about where we currently are? Also, when you are answering that, we do seem to have some conflicting evidence about how much oil is still to be recovered. We have Professor Kemp telling us that there is 11 billion barrels still to be recovered from the North Sea, and that seems to range from anything between 4 billion and 20 billion. In response to how you think we are going, where we are at, maybe help us to just to understand why there does seem to be a disparity of views about what is remaining and what your view is about what we still have to recover. We will start with you, Mr de Leeuw.

Professor de Leeuw: Maybe I will break it down in two parts: one is the history and then the point forward. I think we have come a long way in the last three years. It has been a really tough time for the oil and gas industry and I think the industry has responded to what has been one of the most profound downturns over the last few years. What has happened, costs have halved from \$30 to \$15 a barrel, efficiency has gone up. Companies—and particularly the operator community—are now back to profitability, with a combination of good operational management and reducing costs and improving efficiency. We see action in the industry here and we will start making some money again and hopefully it will create investment, but that is kind of the response to the oil price.

The second question, Chair, you asked about what is the range of outcomes. I think we have line of sight as an industry between what is already producing, what will come onstream in the very near future and what is on our collective books to be done is somewhere in the 9 billion to



12 billion barrel range. Professor Kemp is absolutely right with that range.

Of course there is a bigger prize out there, but that requires higher prices, it requires technology, it requires different ways of working, it requires collaboration in the industry, which is going to be different than what we had in the past. The future prize is out there and if we get it right, it will be a huge prize to the UK, a huge prize to Scotland, but it will require a different way of working than we have done in the past. A great start, but I think the next couple of decades are going to give us an interesting new challenge.

Chair: Mr Reid, where are we? How are we doing?

Willie Reid: It has been an interesting few years. When we look at the crash that happened in 2014, the industry was absolutely devastated in the supply chain. I look at comments and quotes: Robin Watson of Wood, who at the Offshore Oil & Gas Conference said, "The world in front is nothing like that behind us"; Sir Ian Wood, "Technology is the be all and end all"; Bob Dudley of BP said, "We need to look at outside the industry for new technology". But when we look back at the developments of the last couple of years, what we have seen is a considerable increase in efficiency of the industry, the development and costs down in terms of OPEX at 40%, CAPEX down 40% and product efficiency up 10%. Of course production over the last five years has in fact increased 14%.

In terms of reserves and where that goes, I have a view that technology will play a significant role in that. There are a number of figures that have been suggested in terms of where those prizes could be, but I feel that perhaps Alex is better qualified to comment on that at this stage.

Chair: Ms Cohen, where are we in all this?

Colette Cohen: I would reflect Paul's comments as well. We have come a long way. I think one of the most important things the industry has done in the last few years is nearly re-baseline itself in reducing those overall costs. It has put us in a really good position. I do not think we can hedge against a growth in oil price; we have to find a way to be competitive and thrive at this sort of lower standard oil price. Particularly in a mature basin like the North Sea, we have to find a way to be as competitive as we can to ensure that people continue to invest here. We have some major advantages. We have a very strong, stable and supportive fiscal regime, we have a huge and capable skilled workforce and now these investments in organisations like the Oil & Gas Technology Centre allow the industry to partner with Government in developing the next technology to really make a difference.

As Paul said, we need to change how we work, but one of the biggest levers we can use is finding the right technology to make it sustainable and to reduce our costs. That does require us to move towards a more digitised industry, to go more towards remote operation, remote control,



automation in general, a larger subsea focus in the future. That sort of approach will allow us to not only have a lower carbon footprint, which is also required for us as an industry to meet the requirements of a low-carbon economy; it would allow us to be competitive. I think there is that element: technology plays a big role and organisations like ours can help.

The other part, how big is that range of opportunity, I think the reason you hear such a discussion is that currently we have about 5 billion reserves attached to pipe, which means already related to either well bores or facilities. It is really the range of the 15 billion, of how do we develop them. That comes into the price, the technologies, the commercial agreements, the collaboration and our ability to create environments where we can reuse and recycle our facilities. That is the work that the industry is doing now. We have discovered resources; we have to find a competitive way to bring them on board.

Q88 Chair: One thing I did notice, the OGA's estimates include figures for expected new discoveries. How can you accurately predict for reserves that are still to be discovered? How does that work?

Colette Cohen: I am not sure I am qualified to answer; I am not sure anybody is—how you can predict. We have techniques and we have a huge history. We also have a great understanding of the basin that we are currently working in and I think using that information and a whole series of algorithms you can at least make a reasonable prediction on what the remaining potential is, but Alex might go—

Q89 Chair: What are these predictions then, Professor Kemp? I see you predict 11 billion barrels. Is that an accurate reflection of what you have said? How do we do all this?

Professor Kemp: We published a paper for a \$60 price case, rising only at the inflation rate of 2% a year, and with capital constraints still being there. Between now and 2050, we came out with a figure of about 11 billion barrels of oil equivalent. That is the economic recovery at that price. We also did it at \$50, where it was a couple of billion less. In our update we will do it at \$70, and I am fully expecting it will be a fair bit more. But above the 11 billion, we had 5.6 billion barrels of oil equivalent, which we call the unexploited potential; that is they were uneconomic at \$60. The challenge going forward is how to make a goodly percentage of those resources economic. That is why I am also saying that, having looked at the regulatory framework and the tax system, a key feature has to be the development of technologies and their consistent application.

As far as the range is concerned, the OGA like to be quoted as saying, "We feel the ultimate future recovery is between 10 and 20 billion barrels of oil equivalent". That includes proven resources, but also estimates of future probable and possible reserves and also undeveloped discoveries, which they do model based on all the seismic data and the leads and prospects as they see from the data. That is the basis of their estimates,



but the important point on the 10 billion to 20 billion is that there is no time attached to that and there are no oil prices or cost attached to it, it is really just the physical thing. We do lots of economic modelling and so we were saying that between now and 2050 at the \$60 price, we can see 11 billion barrels of oil equivalent being economically recovered, but that leaves a very substantial extra to go for.

Q90 Chair: Grateful; that helps us out. The last general question from me to open things up: we had Sir Ian Wood in front of the Committee a couple of weeks ago. He was helpful, as always, and we went through the Wood Review from inception to legislation to the realisation of the OGA and of course the Maximising Economic Recovery strategy. What difference do you think this has made to the prospects of the UK Shelf and what are your general views just about the progress that has been made since we have had this legislation in place? We will start with you, Mr Reid.

Willie Reid: I think it has made a significant difference. When I look at the feedback in my regular contacts with Andy Samuel's team and Carlo Procaccini in the technology side of the OGA, there are a number of key parameters that have been met. But one of the areas that I get involved in significantly in terms of introduction to strategy et cetera is one of the things they introduced was they asked all operators to have a technology plan. This again is one aspect that I just wanted to make sure we covered, because that has led to an insights review, which was published in April, which again gave us a picture of where the operators were getting involved in technology.

Yes, there are other aspects of this, and I mentioned the improvements et cetera—the engagement, the encouragement, the collaboration—but I think that is one area when we look at that report where there is evidence of collaboration: 20% of the operators in fact get involved in collaboration with vendors—that is a healthy sign—and 45% get involved in developing new technologies. How can you put it? There is an engagement message in there that was not there before and I think that bodes well for technology introduction going forward.

Chair: Grateful. Anybody else?

Professor de Leeuw: Chair, if I can add a few things to it, I think there are a couple of things that have played out in parallel. First of all, after the shockwave of the lower commodity prices, there is a lot of industry self-help that has taken place. The industry had no choice but to reduce cost, improve efficiency and get business back on track. I think the creation of the MER UK strategy, and particularly the OGA, has been a hugely powerful catalyst to help the industry to work on a collaborative model, but also put a spotlight on what needs to be fixed. I think the focus on fixing areas around the fiscal regime, fixing areas around how do we make sure we drive more investment, fixing the areas around how we drive more seismic, how we get organisations to work, and looking at area plans—the whole range of what a good regulator will do—has been hugely helpful. I think the combination of that has been really powerful.



You can link it in with the creation of the Oil & Gas Technology Centre and other initiatives and you get a very powerful package that puts the UK as one of the real competitors now in the world in terms of its regime, attracting money and everything else. I do not think that would have happened without the MER UK strategy that was worked on by Sir Ian Wood and others.

Colette Cohen: I would just agree with that. I think there is one other element that has really been built from the Wood Review. If you imagine there were 27 different actions that we had from that, and of the big elements, getting a strong regulator was key, focusing on technology was key and the other was focusing on our ability to collaborate more effectively together. I think the Wood Review shone a very strong spotlight on all of those key issues. We have delivered against all of them through the OGA, the OGTC and we even have a champion for collaboration in the industry now in Steve Phimister on behalf of the OGA.

We have a Vision 2035, which we also did not have prior to this. We have a technology vision that has 10 major challenges now being worked on by the Technology Leadership Board, which will be used by the industry. Combining all of that, the Wood Review drove that and allowed us to get to the point where the industry submitted its own sector deal for the first time this year, a combined, aligned voice supported by both supply chain and operators in a single document. We would not have done that, I don't believe, if we had not had the momentum created by the Wood Review and everything that has come since.

Q91 **Chair:** Professor Kemp, I know there are the six key taskforces that have been set up as part of MER UK. Are these the right taskforces, do you think, or are there are other things that need to be reviewed as we go forward?

Professor Kemp: Yes, in general I would agree. The establishment of the OGA, a much better-resourced organisation, has been a major step forward. The former Department of Energy was under-resourced as far as the oil sector is concerned. The OGA is better resourced; it has people who have a deep knowledge of the industry.

As far as collaboration is concerned, yes, Sir Ian Wood highlighted how there was a non-collaborative ethos before, but one of the prime objectives of the OGA in facilitating Maximum Economic Recovery is to encourage more collaboration. Some is happening, but remember the background is one where companies were competitors: both operators and licensees were competitors, and in the supply chain there were competitors as well, and collaborating with competitors is not so easy. I see a challenge for the OGA going forward is to ensure that all the clear advantages of collaboration are realised, and that will require a lot of skill, because after all, companies are competitors as well. The OGA can be the trusted intermediary and discuss things in private and get maximum collaboration.



Q92 **John Lamont:** My question continues from what Sir Ian Wood told us. He stated that the current rate of exploration is disappointing. I wondered if you could maybe explain why it is so low and what needs to be done to drive it forward. Any takers?

Chair: First in there.

Colette Cohen: In fairness, exploration is the foundation of everything we do, but it also has one of the slowest paybacks. During a period where you are short on funds and prices are low, it is hard to drive that investment into something you are not going to see a return on for maybe seven or eight years. However, we all do know it is a foundation on which we grow and so companies continue to try to find competitive exploration opportunities. One of the areas that we are looking at is how you make that more competitive, so there is a need to try to help drive the costs down in exploration. Exploration wells have become incredibly expensive over the last 10 years. We need to find a way to bring that cost down and also to reduce the uncertainty around what you find.

Believe it or not, the digital advancements are hugely helpful. This concept where industry is now starting to share their data, so you have a much broader wealth of data, allows you to apply big data and machine learning and artificial intelligence to try to help us find those next opportunities, but also reduce the uncertainty around those opportunities. There is work ongoing to try to increase our potential and the opportunities we will find in exploration, where it will take a little bit of time.

Professor de Leeuw: Maybe a few things to note. It is both the volume of exploration and the quality. If I go back a few years, we produced 10 or 11 times more than we found. Last year, we produced twice as much as we found. Although we did not drill as many wells, the quality of the wells was better and we were quite lucky to find some pretty good prospects. I do think it is a question around how we get both the volume and the quality right. A lot of work has been done by the industry and again by the regulator to make sure that everything is available before we explore: seismic is made available, technology solutions are made available and people have a better understanding—before they even go in there—what they have. How we drill wells and simplifying it, great work done by OGA and Oil & Gas Technology Centre to drill cheaper and better wells, but also afterwards, they give people almost instant solutions. When you have found it, Colette absolutely correctly said it is a long wavelength to get a deck onstream again. Can we give them some instant solutions of how to get back it onstream again?

I think we learnt it is volume and quality and we learnt around the process. When I look at the difference between the 29th and 30th licensing round—the 30th licensing round only awarded a few weeks ago—a huge amount of new blocks, new places coming in exactly for that reason, so saying, “We see a different element happening here”. The



building blocks are in place. We need to give it a bit of time, but I think the ingredients are there to get a better outcome.

Willie Reid: We are seeing what happens in the curve in oil and gas. At the end of the day, the OGA, when it was formed, indicated it wanted to lower costs of drilling by about 50%. Colette and her team have set up a focus on exploration and doing things better. That will take a bit of time, but at the end of the day, incentives of some kind may assist. It is a combination of the drilling, where to drill, and there has also been a look at combining information in clusters, which again comes into seismic and all these developments in digital benefits, where you can look in an area where there are perhaps multiple operators and see how they could perhaps develop that better.

Q93 **John Lamont:** Last September the Chancellor announced funding to explore or to survey under-explored areas. I just wondered what impact that was going to have and how that money was going to be directed into the most effective use.

Professor de Leeuw: I think it is great to see that funding has been available. Of course it takes time, so it is early days. First the money is made available, seismic needs to be shot, it needs to be interpreted and that needs to be used. There is a cycle where that takes place, but it is always welcome to get a focus on moneys in that particular area, but as I said, it will take a bit of time before we see the impact. We have seen some of it from the previous moneys made available in the 30th licensing round, where some great initiatives came out of these activities.

Professor Kemp: The provision of seismic data from Government should help. It should help small explorers in particular, where the cost of the seismic is a significant consideration. The main idea behind the provision of seismic data is that it should reduce the failure rate and increase the success rate, so the nation should benefit because of a better expected success rate. As far as the economics is concerned, if you are deciding whether to go exploring, of course you will be interested in what you might find, but also, as my colleagues have pointed out, it depends on the cost. The fact that the exploration costs have come down quite a bit is also helpful. The development costs have also come down, so for a full-cycle operation, we are in a bit better position now than we were when the costs were very much higher. That is my basic position.

There have been lots of discussions about whether we should have adopted the refundable tax credit, which Norway has. We did quite a bit of modelling on that and it does not make such a big difference in the UK compared to Norway. In the case of Norway, it makes a big difference if you are an explorer and you can get 78% of the exploration costs refunded. In the UK, the corresponding number would be 40% and it does not make such a big difference. The tax system has been adjusted quite a bit and it is not, I think, the main issue now.



The main issue is more on the fundamentals of the mature basin, and the policy steps that have been taken recently should be helpful. In fact, I think the results of the last licence round were quite encouraging. Given the circumstances of the industry when the round was launched, where prices were lower than they are right now, I thought that the response in terms of willingness to drill was quite encouraging. Not very high compared to 20 years ago, but still, in the present environment, reasonably encouraging.

Colette Cohen: Can I just build on that? It builds on where you started with your question on the Government investing in something like seismic to try to promote or drive further investment. In actual fact, the success of the 30th round was driven not only by having data available about the licence; they were going into information on the small pools that were already discovered on those licence blocks, and a number of workshops hosted by the OGA, co-hosted with the Oil & Gas Technology Centre, were looking at what will be the technologies that would unlock those potential assets.

This time you have a group of people who have taken on a licence, who understand it better than they have ever done before, coming into a licence round, knowing what it would cost, knowing how it could be done and knowing what their uncertainty is. Our chance of things being developed on these new licences is much higher than we have had on previous ones, because we have taken a different approach to the licence round, which I think it is a really positive collaborative approach.

Q94 **Ged Killen:** That leads on to my question: how effective is the OGA's licensing approach in encouraging exploration? Sir Ian Wood told the Committee that the licensing regime can lead to highly individualistic behaviour in the industry. Do you think the regime could be used to force greater collaboration between companies?

Colette Cohen: I suggest that the 30th round has taken a different approach than previous rounds. We will see if it delivers what we are hoping it will deliver, but the level of engagement of operators, big and small, in the whole discussion in advance of the round being put forward for bid was really encouraging. The level of activity in the workshops, people's engagement and that level of knowledge about the licence you were about to apply for was so different this time compared with previous rounds. This is really the test case, to my mind, of a change in a collaborative approach and changing behaviours related to that. We will see, but what we have seen so far I would say is encouraging.

Chair: Any other takers?

Professor Kemp: One point I would add: a feature of this last round has been quite a substantial number of new entrants, some of them backed by private equity. I think that there has been a change in that respect, a considerable number of new entrants in fact willing to engage in exploration. I would highlight that as well.



Professor de Leeuw: Can I make another addition? Again, if you look at the nature of the operators—and Professor Kemp already talked about it; Colette talked about it—they will be different in the future. We need to make sure we have an exploration licensing regime that reflects that. They cannot necessarily afford to do all the seismic work, so we need to make it available. They do not have all the technical solutions themselves, so we need to make a technical solution available. They might need an area plan, an area connection. Again, we need to make it available as part of our licensing round.

That is what is playing out, particularly in the 30th licensing round, that I like, because it drives a different outcome for the North Sea and things about what we need in the future and getting ready for that now. I think doing that kind of thinking ahead is really helpful to create a hugely competitive environment where we drive more investment, more activity coming in. Because if we don't do it, we do not deliver MER UK.

Willie Reid: When I talked to the OGA last week, they talked about a databank, which again is not the exploration itself, but it is the information that makes the exercise itself more efficient. In that area, there will be a development of a databank that will be used by various parties.

Q95 **David Duguid:** All this talk about collaboration, it is great to hear. Obviously technology is going to be very important. On the radio this morning I heard the oil price is currently about \$75.5 a barrel, which is great news compared to not that long ago. But the industry having been through price cycles in the past—you can probably guess where I am going with this—how does collaboration help or what else does the industry need to do to avoid going back to the bad old days and the same old wasteful behaviour that we have experienced when the oil price goes shooting back up again?

Professor de Leeuw: It is a nice straightforward question; it is fantastic. The main thing is around huge volatility in price, and you picked up the oil price: it is somewhere between \$73 and \$75 a day. That is today. We need to think about what is the long-term price. If you look at the forward market this morning for the next so many years, it is more between \$60 and \$65 further out. When you think about your long-term investment cycle, you need to think about what is the long-term price rather than the short-term price. People are very conscious around this: we have had quite a big shock in recent years. We need to make sure we learn from that, because some of the cost savings we have will be sustainable, some will not. If we want to have a North Sea that works, a North Sea that competes, then we need to make sure that collaboration is part of our rulebook, it is part of our DNA.

If we do not do that—if you think about it, the UK is less than 1% of the world's production, less than 0.5% of the world's reserves. People have choice of where they put their money and if we want to attract a disproportionate amount of capital and activity to the UK, we need to



make sure there is an environment that is fiscally attractive, that works, has a powerful supply chain and has the technology provisions, but also makes sure that when you come in here, it is an easy environment to invest in and deliver results. I see collaboration as part of our DNA in the future, rather than something that was just a reaction to the price.

Chair: Does anyone else want to comment on that?

Willie Reid: I would also mention we have to look to this industry for the future and developing the supply chain and the skills, looking at digital, looking at automation, looking at artificial intelligence, looking at how industry and technology can be transformed. The oil price is a market and markets go up and down and we have little control of that. However, what we can control is the investment and the development in technologies and industries going forward that relate to our experiences in the North Sea, relate to where we can export, relate to the skillsets in subsea and relate to the areas where we can develop competitive advantage. We need to seriously look at investing and developing in those areas to help those UK companies to export.

Professor Kemp: Can I give an example of collaboration that could have a significant effect? The remaining potential is, to quite an extent, in quite small pools, quite small fields. One way to reduce the cost is to have a cluster development, whereby several fields are developed with a common infrastructure, like a hub. That will often require collaboration because the different fields geographically may have different owners and a lot of collaboration is necessary. Looking ahead, I think that cluster development with the need for collaboration to effect the agreement will be important.

Also of course for the small developments, they want access to the infrastructure of pipelines and terminals. Again, to get more collaboration between the asset user and the asset owner is a challenge for the Oil and Gas Authority, which historically was a difficult one, but hopefully in this new environment will be more successful.

Q96 **Ross Thomson:** Following on from my colleague's question around collaboration, one of the big risks—and I know it is high up in Andy Samuel's agenda—is that the industry goes back to some of those bad and poor practices of the past after the last couple of years, when there has been more collaboration. My question is are we very much beholden to the companies to behave in that way voluntarily? Do you think the OGA has a role to ensure that collaboration continues? Do they have a role in ensuring that we do not go back to see more competition than collaboration, and does OGA have the teeth to ensure that some of that can happen? I would be interested to get your feedback on that.

Colette Cohen: It is a requirement for the OGA to see that companies continue to show the right behaviours, because as Paul already said, we will not deliver MER UK unless we get this collaboration, unless we work together. As Alex said, a lot of the small developments require a high



level of collaboration, whether it is on the commercial terms or technology development or just shared logistics and shared resources to develop them. There is a requirement for us to be successful that we collaborate.

There is a challenge going forward: we are not mentioning it, but I think we have to, that we have lost a lot of people and a lot of capability and a lot of rigs are in cold stack at this stage. Even the warm stacked rigs are already back on. I am aware some the drilling communities in Italy and places like that tried to bring back on the cold stacked rigs. That will drive price; that will drive a level of competition for those assets. As a result, that is the sort of thing that potentially drives bad behaviour. I think as we move into this period in the summer—where we have what we call the turnarounds, the shutdowns, we engage a lot of people quite quickly, a lot of resources quickly, where you might want to bring on good conditions for drilling, so again, you want your rigs on quickly—we have to be careful during this period that we collaborate effectively, we talk to each other.

The OGA has a great opportunity as a trusted adviser and somebody who sees the bigger picture. Everybody talks to them, they know everybody's plans and they can help and facilitate a greater level of collaboration and working together. Do they have the teeth? They probably do, because in fairness, MER UK is a legislative requirement for operators. Is that the best way forward for them to deliver, using their teeth? Probably not, but I think there is that reality that it is an obligation for us to deliver MER UK. The best way we can do it is by collaborating. I do, however, think there probably needs to be the odd moment of stick, where you turn around and say, "No, this is not how we want you to behave. This is how you can".

Again, I think organisations like ours—we have already talked earlier about how we have a huge amount of co-investment with industry—are seeing that collaboration. We are seeing those pockets remain and we are talking about investment that goes between now and the next two or three years—these companies committing together to develop technology. We are seeing the right behaviours, we just want to maintain them.

Professor de Leeuw: Can I interrupt very quickly, Chair? Collaboration means a coalition of the willing; you can't force people to be collaborative in behaviour necessarily. I do think there is a real business imperative to do so, because although we reduced our cost base quite dramatically in the industry, not everything is sustainable. Again, there will be a cost to everybody if we do not get it right.

The other thing is of course that the shape of the North Sea is different. Already my colleagues talked about a lot of new players coming in. We probably have a far more fragmented grouping of companies. If you want the outcome we want collectively on the MER UK, we need that kind of



working together element. How we wrap it up, collaboration, all those kind of words, it doesn't matter. It has to be done to give us the outcome. We all learn. This is my fourth down cycle and I have seen it many times before, but I think we need to get it into our DNA that this is different.

Chair: We will maybe move on, if that is all right, because we have lots of questions to ask you and there will be lots of opportunities. Danielle Rowley.

Q97 **Danielle Rowley:** Just going back to data, there have been a lot of programmes and projects on data, including the Call for Ideas, but to truly drill down into the issue, if you will excuse the pun—

Chair: Somebody had to say it, didn't they?

Danielle Rowley: —the OGA are taking steps to make more data available to drive exploration, yet some commentators have said that there is still a lack of transparency for some companies. Would you agree with that and what data would be most useful for the OGA to make more widely available?

Willie Reid: I can start by just covering a particular point, that when the Technology Insights review was done, it was found that there are 70 operators in the North Sea in total. When that analysis was done, it was found that there were seven to 10 key operators whose approaches, technologies, development et cetera were of a high standard, which could in fact be transferred to these other operators. Clearly data is proprietary to the OGA, but that is an example where there is evidence that there are benefits from data that is available from other parties being transferred. It is a question of how that is transferred.

Colette Cohen: We are seeing a greater willingness of companies to come forward with their data. The OGA is becoming a great repository for that, not just from their asset stewardship survey, which brings a wealth of data every year on performance, but they are also looking at the CDA, which will gather other well data and seismic data. It is working out how to use it, because even then some of the smaller companies will not have the data analytics or the capability to take this huge lake of information and turn it into something that is actionable. That is where again the collaboration between some of the key operators, who can drive some of that, and the developers is really important. The first thing is to stop treating data as a proprietary asset, when in actual fact how you use it is where the competitive advantage is, rather than the data itself. We are starting to see operators think like that. It is now developing the right capabilities and the right applications to allow us to analyse that data, to learn from it and to turn it into real actionable information.

Professor Kemp: Historically the position of data is that it was regarded as something that could give a company a competitive advantage. The idea of sharing liberally was not high on the agenda in the industry historically. Now things are changing and the skill of the OGA will be to



encourage more of it and to encourage the idea that everybody in the industry will gain by a greater willingness to share because they are all part of the industry and, on some occasions, one company sharing data with another might help the other companies, but there should be reciprocity. A challenge for the OGA is to continue to do that. They are the trusted intermediary, as it were, and they are more in private than in public. It can show how everybody is gaining in our geographic area. If more of the data is shared, that enables better investment decisions to be made to the advantage of everyone.

Q98 **Hugh Gaffney:** What are the key pressures facing Scotland's oil and gas supply chain? By that I mean as it stabilises, is there any political pressure on oil and gas? The indicators for 2014 show that oil and gas was rising up, sometimes maybe down, so was there political pressure on those areas at the time?

Professor de Leeuw: I am quite happy to start on that one. You are absolutely right. Again, what tends to happen, the oil price goes down and the operator community pulls the handbrake in terms of investment and activity. There is a lag time of about 12 to 18 months before it hits the supply chain, so we see an absolutely big impact in the supply chain from 2014-15 onwards. We see it both in the UK as well as in the export potential of the supply chain. We have a hugely powerful supply chain. Again, not every company is affected in the same way, but there are some companies who focus predominantly on the operating activity and have been continuing on driving more efficiency. It of course has an impact, but the ones who have particularly been quite badly hit are the ones who focused on capital activity, so it could be seismic companies, data imputation companies, drilling organisations and others.

What we see happening now on the back of oil prices heading hopefully in a slightly different direction, is investment returning to the basin, and we see particularly people looking at putting new money back into the North Sea, but of course then it will take a little bit of time to filter back into the supply chain. We see the signals happening, both on the operating side and the supply chain side. The big exciting one, which Colette already mentioned, is around the future of what we want to do. That is around Vision 2035, because we see both a very strong future for getting more out of the North Sea, but also developing the supply chain to be a truly international transnational supply chain and doubling from what we currently do between now and 2035. The supply chain is going to be pretty much the centre of all the Vision 2035 activity. That means we need to have a healthy supply chain here, but also make sure that we help them to export it to overseas locations. Tough time; things are changing and I think we need to make sure collectively we help each other to be successful.

Colette Cohen: One of the other things we have probably learned during the last few years—and there are a number of pressures or levers currently going, whether it is COP 21 or some of the new legislation that



has been introduced by both the UK and other countries as we move towards a low-carbon economy—is the requirement for the supply chain to also diversify. This is not necessarily because the oil and gas industry is declining in the UK, but more that it is going to be an energy balance that we see going forward; it is going to be a mixture of renewables and oil and gas, particularly through 2050 to 2070. It is important that our supply chain, which is highly skilled, highly capable, really heavy industry oriented, diversifies into that broader energy delivery model, and that allows us not only to maximise their potential within the UK, but also maximise their export potential.

Professor Kemp: Yes. The supply chain is really the bedrock of the north-east of Scotland's economy and in the published data it is not too easy to just show how big it is, because while we know the oil and gas production sector relatively well from public data, the whole supply chain is diffused; it covers a lot of areas in the national accounts. It includes lawyers and accountants, whose presence here depends solely on the oil and gas sector being here. It is difficult to overstate how important the industry is to the local economy, and going forward it is encouraging that over the last couple of decades the export activities of the supply chain have grown and grown and grown, faster than the activity in the North Sea itself. There is every chance that growth in overseas markets will continue, particularly, for example, in the subsea sector. There are difficulties for the SMEs: for them to break into foreign markets is quite expensive, so Scottish Development International and these kinds of activities to help gain entry can make a big difference.

Willie Reid: I will be very short in my response. It is really the engine room of the industry. There have been so many mergers and acquisitions in the last period, which demonstrates the serious difficulties that the industry went through. However, like all industries, it recovers. There was a very good review indeed by Ernst & Young in January, which is worth reading, which talks about the whole supply chain aspect. What I would say—again something I would highlight—is that Wood had an industry which in 2014 was 86% oil and gas. Wood's industry is now 48% oil and gas and it is involved in robotics—the car industry. It has diversified into a number of industries in the States.

We are going to see not just supply chain companies diversifying into other areas, but one of the points that I feel very strongly about in technology is that we are going to see technology from other sectors benefit the oil and gas industry. At Strathclyde, we have had 27 new technology projects in the last two years. The majority of those are with oil and gas companies and the benefit is coming from technology developed in other industries.

Q99 **David Duguid:** I am fascinated to hear about the value of diversification because across the north-east of Scotland there has already been a history of engineering industry diversifying from the more traditional industries of fishing, farming or supplying to the fishing and farming



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industries, for example, and into oil and gas. We have already talked about how important it is to be able to export that further, beyond the north-east of Scotland. What can either the UK or the Scottish Governments do to support this activity?

Willie Reid: One of the things I did in my introduction was to specifically mention the oil and gas sector deal. When we look at how we can develop this industry, that is a very good place to start. In terms of diversification and where things go, for me, as Alex mentioned, exports and development of technology and industry take a bit of time, but the reality is that in Scotland we are very fortunate to have a very good mix of talent and universities, high-quality engineering companies and also we have this huge advantage in the subsea sector. If we invest and develop in the right way there is great potential. Export is perhaps the most significant development and again I stress the sector deal.

Colette Cohen: There is a perfect opportunity for how both the Scottish and UK Governments can help the industry move towards this, and that has been put forward in the sector deal. This outlines an underwater innovation centre, which crosses multiple industries. It is not just about oil and gas, it is looking at aquaculture, marine, military. It covers the whole opportunity of really ensuring that the UK and the north-east of Scotland—which would host it, but it is connected throughout the whole of the UK—creates a single one-stop shop for anybody in any industry to come and engage in the underwater innovation space. It also creates that opportunity for other countries and groups to come in and be able to interface with the UK and all the expertise that exists here in underwater engineering, particularly subsea, because that is where we, as an oil and gas industry, have really excelled.

Our ability to invest in that right now, create that hub and opportunity, not only allows us to maximise economic recovery for the UK, but positions a whole supply chain, particularly that of the north-east of Scotland, for a long-term future in a diversified market. You have that and you also have in the sector deal a request for the transformative technology centre. That looks at a low-carbon economy technology for the oil and gas industry, again positioning a supply chain that will be able to deliver—not just in the UK, but globally—equipment and services that provide to the oil and gas industry, but deliver in a low-carbon manner. That is hugely valuable to us both locally and internationally. From my perspective, that is how the Government could really help the oil and gas industry and its supply chain for the future.

Professor de Leeuw: Can I add a few things? It has been very powerfully put as an argument, but just on how important this industry is, roughly one in a hundred people in the UK either works for the oil and gas industry or supports it, so it is hugely important. We have just finished a piece of work on workforce dynamics with OPITO, which is the training provider for the oil and gas industry, and Robert Gordon University. If you look at the people directly working in the industry,



people who work for the operator and supply chain community, it is about 170,000 people. It goes up and down; this is a 2017 number. Of that, around 10% work in the operator community, the rest work in the supply chain community. If we want to make sure we have people doing high-value jobs in the future, this is critical. What Colette talked about, the sector deal, is absolutely critical to keep the capabilities and skills we have in our industry there for the future.

It is really important, not just from an oil and gas industry perspective, but for energy diversification, leveraging our skills in other sectors—all the elements pretty well described in the sector deal—are going to be key to making sure we can appoint that incredibly capable workforce for the future.

Q100 Chair: Can I just ask, do you feel you get the access that you require from Government Ministers? Do you feel when you approach them with these types of suggestions and initiatives that you get a favourable response?

Colette Cohen: Through this process, they have been very supportive and BEIS in particular has really tried to enable the conversations. Where you run up against a little bit of a challenge is that the process is relatively new for the Government Departments in working out how to use the Challenge Fund, and how to process the sector deals. They are a great idea. The whole Industrial Strategy is a super concept for the UK in working out how we are going to maximise economic recovery in all the different industries. Working out how you then, as a Government, interface with those sector deals to support them and fund them is not as transparent. That is where the challenge is: great conversations, but we do not have a clear roadmap of how we go from a great idea, completely galvanised and supported by an industry, to a timely conclusion of, "This is how we now move forward". To ask the industry to move forward without knowing whether the Government is supporting it creates a level of confusion. Transparency in that space would be fantastic.

Professor Kemp: Can I add a footnote in the historic perspective? It is very difficult to get figures on what R&D expenditure there has been in the energy sector over a long period. There was a former Minister, Malcolm Wicks, who wrote a report after he no longer was a Minister, which did have a table on R&D expenditure in all the energy sectors in the United Kingdom. It is a few years old now, but the main point is that compared to the 1980s, in the recent decade or more it has been very low. That is both private and publicly financed R&D in the fossil fuel sector, as he called it. What has happened with the establishment of OGTC and OGIC has helped a bit, but clearly there was a long leeway to make up compared to what happened in the 1980s. I myself would agree that the national productivity gains from having more R&D in this sector could be quite substantial.



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Willie Reid: Just to add to that, if you look at other industries, typical rates are 3%, some even 7%, in aerospace manufacturing et cetera, and if you take Alex's number, oil and gas is way behind.

David Duguid: Excuse me, Chair, can I just ask one more question on the exporting of the supply chain?

Chair: Yes, of course.

Q101 **David Duguid:** In your opinion, are there any particular global markets or opportunities for the industry that the UK Government, in terms of their future trade policy, could actively pursue?

Professor de Leeuw: One thing the UK is extraordinarily good at is offshore developments, subsea developments, project management in hostile environments. If we look around the world where we see similar type activities taking place, a lot of activity is happening in South America, where there are currently quite a lot of big finds; we see west and east Africa opening up, where there are big subsea kits going in. I do think there are some really clear target markets where we can leverage our expertise.

Credit to the Department for International Trade and Scottish Development International and to some of the trade bodies; they are already pushing that. If we want to make Vision 2035 work and we want literally double our export potential, we have to do it differently than we do it today. We are not staffed, across the industry or across Government, to do that. There needs to be a roadmap, a plan in place of how we drive and leverage that export potential. The markets are there, the willingness is there, our capabilities are recognised. What we now need to do is put a real, clear plan in place saying, "What are the specific requests that need to be made of industry, Government and other partners to make sure we set that in motion?"

Q102 **Ross Thomson:** That discussion feeds nicely into my question, which is around the oil and gas sector deal. I have been working with industry already here to beat the drum for it, but for those who are listening to the Committee discussions today, can you explain exactly what a sector deal is? From your perspective, what tangible impact would a proposed sector deal have, if approved, on the oil and gas industry? What does it mean for people in their daily lives here in Aberdeen, Scotland and across the UK to get such a deal signed off?

Colette Cohen: That is a great question. A sector deal is something that is driven by the Industrial Strategy. It has been asked for by Government, of all sectors, to come forward with a long-term view of what the sector could deliver to the UK economy, but what it would take to do that, so where the gaps are. What is the potential and then where are the gaps? In the oil and gas industry, they have identified just under £1 trillion of potential value between now and 2035. Part of that comes from the Vision 2035 from the OGA and then the improved recovery from operators and how we apply technology and get that maximised



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economic recovery. There is also an increase in the supply chain. Then we looked at that further and said, "What more could you do if you started making sure that, first, you were here for a sustainable long term, you were diversifying the potential of your supply chain?" They identified quite a large additional value of about £500 billion.

To deliver that, there were a number of things that would be required. One was the underwater innovation centre that the industry believes will cost about £88 million to create. They are looking for £35 million from the UK Government and then the rest will be provided by industry. That creates a centre that will, as we have mentioned already, galvanise around underwater innovation in general, not just with the oil and gas industry, but for renewables, for marine, for aquaculture, for military. So you become this centre of expertise globally that allows you not only to develop the right technologies, it allows you to deploy them, have expertise in services and expertise that you can export.

The other was around the transformative technologies, where you are saying, "We are doing a lot already in fixing today and trying to maximise economic recovery and investing in technologies that deliver that, but you now need to prepare yourself for a low-carbon economy". How do you ensure that the industry provides hydrocarbons in the lowest carbon footprint possible? How do we ensure that we deliver the next generation of facilities that are carbon neutral or even carbon positive, if we can find a way to use other people's carbon in a positive way? That is one of the other areas.

One of the things that the industry is already doing is that it is committed to a national decommissioning centre of excellence, which is already being built here in the north-east of Scotland, and now allows us to try to minimise the cost of decommissioning to the UK sector and to the industry, while at the same time developing the technology landscape or capability and service capability that is exportable. While we are at the forefront of decommissioning as part of the energy cycle in the UK, multiple basins are following us. Our ability then to develop the appropriate technologies and bring them elsewhere is a huge export market.

There are a number of other things within the sector deal that talk about jobs. You are asking what is interesting for the north-east of Scotland people: sustainable high-quality jobs, the kind of jobs that the next generation are more interested in; remote operation, automation, robotics, data analytics and data science. You are looking for that next generation of sustainable opportunities and for cultural behaviour changes and a sense of innovation. That is all packaged in a sector deal.

Professor de Leeuw: Can I add a few things Colette has probably described already, but with maybe a slightly different cut on this one? Look at the Oil & Gas Technology Centre, there is about £360 million going in over 10 years, half from industry, half from Government.



Including the sector deal, it is probably £500 million going potentially into the sector, which is hugely powerful. How is this going to show up and feel? If you start thinking about it, this is exactly what we need if we want to deliver MER UK and do the energy transition, because all that plays out between now almost and 2030, when the commitment is about the climate change agreements having to go in place. If you want to get the best out of the UK and the energy transition, get the right skills in place: that is exactly what needs to be targeted in terms of the sweet spot for the money to go into.

The reason why this is so important—you heard Professor Kemp talking about it earlier around line of sight to 11 or 12 billion barrels—by the time you get to 2035, somewhere between 7 billion and 9 billion of the 11 billion have been recovered. If we do not do anything in that in-between space, we have an issue. Collectively, we need to be really mindful that this is not a nice-to-have; the industry has been working very hard to get a sector deal done. There is a purpose in mind to it: it is more than technology; it is about technology with a clear purpose to deliver both what needs to be done here, the export potential and to make sure there is a future beyond 2035.

Willie Reid: You asked about impact and the big impact in the supply chain. From my perspective, subsea centre, decommissioning, transformational technologies, in particular taking technologies from other sectors into the mix. Timing is very important. Now is the right time to do this: in terms of where the cycle is in the industry, it is absolutely perfect. There is a momentum. OGTC has done an amazing job in the last 15 months. If you look at the momentum that could be carried through, this could be significant.

The final point I am going to make is that this is a hub and spoke model. At Strathclyde we have developed many of those models, and Sir Jim McDonald has spent maybe £750 million in the last 10 years in developing centres of excellence in these survey areas—lots of experience. The reality is that these centres are hub and spoke, so the expertise of other areas is distributed throughout Scotland and other parts of the UK and that is important in terms of accelerating the programme where other experiences exist.

Q103 **Ross Thomson:** Thank you for your very helpful answers. As someone from Aberdeen, I understand the importance of the industry, but also the potential that it has still and the long-term future it has. Understandably, across the UK that view maybe is not understood by others—policymakers as well as other organisations—who will say, “Look, the UK Government already has a competitive fiscal regime. There has been a City Deal investment. Why should the oil and gas industry receive more?” I am fully on board with that because I am beating that drum, but in terms of us being able to take that challenge to others, how would you address that point? What would you say to them is the real benefit of ensuring we continue to get this investment when there are lots of



competing priorities?

Colette Cohen: Taking it from the point of view of the recent investment, which is really the Oil & Gas Technology Centre, one of the things there is that co-investment with industry. What you are looking for is at least a 50:50 commitment. What we have shown already in the first 15 months is we are getting way more than 50% coming from the industry. There is that willingness to participate, but it is that combined risk and shared investment in the future. Ultimately, if you are asking for any individual company to invest in their R&D, they will become quite proprietary; they will protect it. They have invested in it on their own, so why should they not? It is their IP.

Whereas when you create environments like the Oil & Gas Technology Centre, it becomes shared knowledge and opportunity. It has an impact for the broader community. We invested in non-intrusive inspection techniques last year with a number of operators, which ultimately were proven and allowed you to save more than £200 million per year for the industry in the North Sea. An individual operator cannot do that, so you need to create environments that allow the industry to invest collaboratively, but the incentive needs to be that shared investment with Government.

First, you are showing that the model works, so it is a great way of doing it, and secondly, if you look across the globe at the competitive index that the World Economic Forum creates for countries, all of those at the top of that index are there because they co-invest with their industries in R&D. They are all the highest investors in R&D globally and you can map the investment in R& D by a Government against their global competitiveness index, which goes to the value and quality of life they create for their population, the skills and the education, so it all goes hand in hand. R&D investment creates a better nation. It is making sure that you invest it wisely, and centres like this, where you are co-investing and driven by industry needs, seems to be one the best ways that you can invest.

Willie Reid: These are also industrial centres of excellence, looking at the market itself and seeing how things can develop more.

Chair: Before you come in, a couple of supplementary questions from around the Committee. We will give you an opportunity to respond to that, but first John Lamont.

Q104 **John Lamont:** We have heard a lot about the challenges of the offshore side of the oil and gas sector. In terms of moving forward and using the skills that we have in the north-east of Scotland, should we not also be looking to explore the onshore opportunities? I am thinking of fracking and the very confused position of the Scottish Government. Is there not an opportunity to transfer skills that we have in the offshore sector into the onshore exploration, which we are not currently maybe exploiting as much as we should?



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Professor de Leeuw: I am happy to kick-start that one. The decision for onshore activity is a political decision. The skills are out there, but it is for the politicians to say, "We want to do that activity". I will leave that to you and your colleagues' wisdom to figure that out.

Q105 **John Lamont:** But are there skills that could be used in that sector?

Professor de Leeuw: Yes. The skills we apply in terms of project management, the subsurface, all the elements around operations are completely applicable to some of the elements onshore as well. Where there is a reservoir, it might not necessarily have the subsea technology; as an onshore technology, yes, it is being used. Remember a lot of the supply chain activity is already being applied to onshore operations around the world, so we already have a track record of doing it.

Would I see that onshore being a powerful addition to the portfolio? Absolutely, because if we produce it here, we have jobs, tax and activity here, we do not rely on imports and it helps with the balance of payments for the UK. Again, the decision to do onshore activity is very much in the hands of the politicians.

John Lamont: Would you agree with that?

Colette Cohen: One of the other areas we are already exploring with the onshore guys is around technology, and particularly if you are going to work in an onshore environment, things like noise, carbon footprint and water usage become pretty critical. They are areas where we are already partnering to see what we can do to improve pumping, emissions and noise management. There are elements where there are skills already there that we can share, but also, as we learn new skills, we can share that too.

Willie Reid: We are talking about upstream, but other important aspects as well are midstream and downstream. Much of the supply chain addresses the refinery industry, which is an onshore application. The second thing, although it is onshore and offshore, is wind, which is developing considerably. The skillsets required in both directions are very close in terms of integrity, looking after these offshore wind facilities in the future. There is a tremendous synergy between wind and oil and gas.

Q106 **John Lamont:** If the green light is turned on for fracking in Scotland there will be a new seam of opportunities?

Colette Cohen: There will be increased opportunities for the workforce for the technologies and skills we already have; we have been fracking offshore for more than 100 years. The ability and the skills are there and they can be used.

Q107 **Deidre Brock:** I just wanted to ask about the B-word, Brexit, and its impact. We have heard evidence from the Law Society of Scotland, which says, and this is specific to this inquiry, "The Brexit issue cannot be ignored as it is an important aspect facing the oil and gas industry, given



its highly-regulated regime". It talks about surveying the powers and that list of points where EU law intersects with devolved matters. It mentions that, "The areas highlighted are complex, very technical and do include energy". Could the panel give us their views on what concerns they have about how Brexit might impact on the industry?

Professor de Leeuw: We have done quite a lot of work on the impact of Brexit on the oil and gas industry over the last couple of years. Again, it is a complicated story; it is evolving every time. We looked at the different components, anywhere from the fiscal and legislative elements, what that means for people, for supply chain activity and for oil and gas production. Of course there are complexities anywhere. What we certainly find, if you look at the fiscal side, most of the fiscal activities are set by Westminster; it does not come from Brussels.

A lot of activity in terms of ongoing legislation is sometimes developed in the UK, it goes to Brussels and comes back in the form of directives. There are a number of ongoing legislative requirements currently we need to think about, which are real-life cases. Where we see particularly the biggest issues on Brexit from an oil and gas perspective—please, I do not make a political point here—is around the potential impact between what is currently in place and going to the WTO tariff arrangements. We see that as having quite an impact on the supply chain in terms of additional cost.

The other one we are seeing is access to high-quality resources and particularly if people are either EU or non-EU citizens. I have talked about how there are about 170,000 people working directly and indirectly in the oil and gas industry, so in operators and supply chain companies. Roughly 10% of that population is either an EU or non-EU citizen and in high-value jobs. This industry is relying on access to equipment, on import and export of goods and services and on people. The main thing again the industry absolutely needs is frictionless access to it and continuous arrangements in place.

The second reason why I think it is hugely important—and again for what is a live debate—is our Vision 2035 relies to a very large extent on exports and doing more activities overseas. We need investment, particularly in the next few years, in the North Sea before it potentially declines in production post-2020. Having investment coming in here and less uncertainties where people are saying, "I am not going to wait to see what plays out" is going to be critical for this industry.

Colette Cohen: The industry is a global one, so all companies involved in it will find a way to make it work. However, what we have to consider is what the cost is and whether it impacts our competitiveness. The biggest challenge for the industry over the next year—and certainly one we are experiencing now—is the uncertainty. The industry, as I said, is a global market, they will make whatever market they are in work or they will withdraw, but uncertainty creates that missed opportunity, whether it is in investment right now in the North Sea, growth in their current business



or the ability to secure a contract in another country because of that uncertainty of what the terms may ultimately be in another year. That is the part that is impacting us and the one that needs to be sorted out as quickly as possible.

Q108 Ross Thomson: This is the right place to ask this question, believe me: what role does technological innovation play in the oil and gas sector and what are the most promising current areas of research and development?

Colette Cohen: I will start. I will, unsurprisingly, say that technological innovation in the North Sea or in the oil and gas industry is of critical importance for the long-term sustainability of the industry and the long-term potential of the export market from the supply chain. More than anything what we have seen in the last two years is our ability to reduce costs and become very competitive. As we have ageing assets, we are going to have to stay focused on how you make those cost improvements sustainable. New technology and alternative approaches—whether it is drones, non-intrusive inspection or other techniques that not only allow us to be more cost-effective in how we do it, but mean that the data and information we gather to be more actionable is really valuable to the industry and allows us to make our productivity higher.

The other part that is important is, as we move forward, things like what kind of technologies are going to make a difference—they probably drive more towards the next generation of developments as well as how we can make our existing facilities a little bit more competitive, and that is around our management of data. It is the analytics that we will use to be able to predict when we are going to fail, but also when we need to intervene and how our performance is being demonstrated. Also then looking at the next generation of facilities: remote-operated, recyclable material, changing from decommissioning to reusing, or just withdrawing, rather than the big decommissioning plans that we have now and the costs that are associated with that. How do we get remote-operated so that we are running from a centre more like this: a remote-operation centre and you are only sending people out as required? That is attractive to the next generation, but also it reduces the cost and makes it more efficient, and high-value jobs are being provided and you are getting a much more continuous level of information about your asset and how it is performing.

The technology around automation, remote operation, digitisation, robotics and materials are all probably the things that are going to make the biggest difference. This is not taking the man or the person out of the equation, it is getting the individual to interact with the information and the asset in a different way. We are talking about co-working, not replacement.

Professor Kemp: When I look at the economics, yes, the technologies which can enhance the productivity of the operations must be at the top of the agenda. For example, we have had this problem of declining performance. The ratio of actual production to maximum efficient rate



was a big problem and that was one of the reasons why in the last few years production went down. Now we are making progress and production efficiency is rising again, but it still has scope to go further. We can see in our modelling that if production efficiency increased to a worthwhile further extent, then there would be very big national gains. That is an example.

Looking ahead on decommissioning, we have talked about the new entrants who are often private equity companies—and they will be in for a relatively short time, perhaps—but we want to encourage them. One of the problems has been the very high cost of decommissioning. If R&D can make a significant reduction to the decommissioning cost, then the prospects for the continuing new entrants with nimble-footed small companies would be greater.

Chair: We are going to come on to decommissioning in a minute, but we will stick to this first.

Willie Reid: I have one more point to make on that. Technology is absolutely critical, it really is, looking at things going forward. Again, I stressed in my opening address that transferable technologies are very important, and I have a list of all the areas where there is certainly very good experience of where this can help. It is asset integrity, aerospace, power generation, electricity generation, grid systems offshore—new ways of looking at that—data analytics, life extension, marine and offshore engineering. We have good examples of nuclear where we have been working in Canada with the leading private supplier of nuclear in Canada to boost power, where we are trying to extend the life of their power facilities by 20 years. That analytics is transferrable to oil and gas. Things like remanufacturing, which Colette mentioned, digital manufacturing, engineering and design, applied physics, satellite technology, offshore wind and Catapult centres around the UK, the impact of technology will have a big difference in this industry.

Q109 **Ross Thomson:** You are absolutely right about how exciting the new technology is and coming to places like OGTC, you sit in a room like this, which is pretty cool, you see some of the new technology around you. You are talking about remotely operating things. I have been here using VR. I have touched buttons on those screens: I do not know what I was doing, but it is so interactive and exciting. Even when I came in I saw a robotic dog. This is a whole change in the way that people perceive the industry. My question is—and my colleagues will see this when they come to Aberdeen Airport, and I always make this reference—that you see the big newtech billboard right across the car park, which shows the industry, with the guys in their helmets and covered in oil, muddy and the rest of it, but yet there is this exciting, new side of the industry. In terms of attracting people into the industry, because you sometimes see it as this dirty industry, what more can we do to get the next generation of people into it? What more can the UK and Scottish Governments do, and even here on a local level, to make sure that we inspire young people around



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the real potential there is in industry, particularly around all the new technology that is being developed?

Professor de Leeuw: Can I maybe, if that is all right, start with that one? We did a big workforce study which, as I say, we finished six weeks ago and looked exactly at this, around how do we get the new people coming in. Depending on which scenario, there are different scenarios in the North Sea—if we just let it slow down, there will be not a great outcome—but we think there is some real opportunity here. Potentially we are looking at recruiting another 40,000 people, replacing those people retiring, people moving on over time. That is very exciting. Out of those 40,000, 10,000 are in new roles which do not even have a name yet. Colette talked about robotics, analytics et cetera. We need to start thinking about and we need to make people excited about this industry in a very different way.

Some of these skills will be industry agnostic, they can work anywhere, supporting oil and gas, but we are going to be an even higher-tech industry than we are now. We are pretty high-tech if you look around at the new developments, but what we need to start thinking about is strategically we need to start recruiting people in a different way; we need to give them a different future. We need to tell them, “You are not joining necessarily the oil and gas industry, you are joining the energy industry, you are joining something international”. That is quite an exciting prospect.

Colette Cohen: It is much earlier: we need to really start thinking about how we educate our children. I have heard stories, particularly in the last week even, from parents whose female children were not encouraged to do physics because girls did not do it. How that could happen still, I was flabbergasted. There was no physics allowed in my school because “girls did not do it” but that was 30 or 40 years ago; I had hoped that had changed, but it does not appear to have. What can Governments do? Absolutely look at your curriculum, look at the way we are teaching. We have to stop having certain subjects that are for girls or certain subjects that are for boys. It should not matter. It is about your skills and what interests you.

Things like robot wars and Lego challenges are really important, because what they are doing is trying to get kids finding fun in science and engineering. Ultimately, engineering is just about solving problems, it is not about building big platforms. It can be sorting out your Adidas trainer or an online programming problem, as well as building a great bridge or the next sports car. Ultimately, it is trying to talk about science and engineering in a different way so that it is giving them an opportunity, a career in a hugely diverse, mind-bending kind of environment. We need to start getting that across early and encouraging children to see engineering and science as an opportunity, not a chemist or a physicist. Do not pigeon-hole; you do not need to. It is a multi-skilled capability and that is what we need to start getting across. It is too late to try to



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talk to them when they are in university or even in their last couple of years at school; we have to start changing the opinions early on when they are four or five, six and seven.

Willie Reid: The key thing is that oil and gas provides transferable skills in engineering. My son is in the industry, I encouraged him to be in it; he loves the industry. It comes from school, yes, but universities as well. The encouraging thing is that a number of oil and gas companies and suppliers have retained the graduates they took on in 2014 and that is very positive and we need to encourage that. Networking: I would also like to mention the Energy Institute and the SPE, and the great job that they do in the north-east of Scotland, where the Energy Institute has more junior members than in London. These young people do join these institutes and they do talk to universities and that is a positive thing.

Q110 **Ross Thomson:** We are getting some fantastic answers. You should go to the Scottish Parliament Education Committee as well, just listen to the passion there.

Lastly, again tying into technology, we have heard very clearly how critical that is going to be to the future development of the industry to Maximising Economic Recovery. Right here in the Oil & Gas Technology Centre we have had over 50 field trials; there have been 95 projects approved. How can we ensure that technology that is developed here benefits the UK? What is the risk about anything that is developed here being pinched by somebody else somewhere else? In terms of people here in Aberdeen understanding how this centre can benefit them, what would be something that I could take to them?

Colette Cohen: Again, a great question, and it was one that we exercised as we tried to design how you would invest and how you would protect that investment. Our process requires that when we invest in a technology we do it with more than two or three companies at the same time. We protect the IP of the developing company and the reason that we do that is what we are trying to create is that sense of innovation and the next opportunity and really enable the supply chain. Taking their IP does not enable them; you really want to prove that IP. To ensure that it gets deployed and that it adds value to the UK, you have to ensure that the knowledge of that technology gets broadly communicated so that everything that we do is then published.

Ultimately, every project has a White Paper. Most of them get presented here—quite regularly on a Friday at 12.30 pm—so we talk about the technologies that we have, we publish them, we share them at SPE events, we put them on our website and we talk to different communities and companies about it. That is important, to be able to say, “Look, we have tested this technology in these sorts of ways. This is how it works, where it works and how you could apply it,” so that you are trying to broadly get it out there so that the community will take it up. Then we actively encourage and work with the OGA to ensure that where this is a technology that fills a gap, they also help promote it, so that you can



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make sure that it is being used appropriately in the North Sea. If a technology gets well-used, it will then get exported as well.

Chair: We only have a few minutes left, and I know there are a few more questions I want to try to get through, so I will try to do it as efficiently as possible. To start us off with that, David Duguid.

Q111 **David Duguid:** It is great to hear the whole panel talking about the importance of education and getting in there early, getting in with the young people. The Committee was at the Highland Show last week where we heard exactly the same thing from the farmers: it is too late when they are leaving school. If you are not interested in farming or fishing by that time, then you are never going to be interested.

I wanted to ask a quick question before I go on to the main one I was going to ask next, which is connected to that: as well as getting young people to join the industry, the ageing population of the industry was also mentioned. Are we finding ourselves with a gap where we still need to attract mature hires into the industry and which industries are we looking at getting that expertise from?

Professor de Leeuw: When we did our review, it was difficult to get a perfect age distribution, but the average age in the industry is somewhere around 42 or 43 and it has been there for quite a long time. Yes, there are elements around where we are losing expertise and we see that particularly as people leave the industry in the circumstances we have seen in the last couple of years. How do you replenish that? Some of the people who have expertise might be on the fields and have been there for 25 or 30 years and that is an expertise you are not necessarily going to replace very easily. We see people coming in from different sectors: we see ex-military coming in here, we see people from other sectors coming in and joining the industry. The main thing is making sure we have an attractive offer. What people are saying is, "I come here not to do a job but to have a career and have a transferable skill to go with it".

As I said, when we look at our review, in the success case what we are saying is we still need around 130,000 people by 2035. Around 90,000 people are existing people we need to upskill and reskill to make sure they can apply the latest technology and developments. It is hugely important, not just to look at eyes on the new workforce and all the attractive new fantastic gadgets, it is also to make sure that this hugely capable, powerful and competent workforce we have now gets upskilled and successful to make sure they have a transferable skill and be successful in the future.

Q112 **David Duguid:** The main question I was going to ask, and it applies to skills as well, but I was specifically going to ask about the transferring of technology between the oil and gas industry and other sectors. What are the challenges that we need to address in that transfer of technology and skills between industries?



Willie Reid: I will start with that. I see it the other way: I see more evidence of benefits of transfer from other industries into oil and gas. I see significant evidence of that. I would say that there is also very good evidence obviously of areas that are transferable from oil and gas, but the reality is that there is now a blur in terms of how that could develop and the market will decide that. Do you know what I mean? At the end of the day the market will decide, and I think that the evidence I have—and the rest of the panel members may have a different view—I see significant benefits of technology and engineers and people from other sectors benefiting around that.

Colette Cohen: I would suggest that technology is quite an enabling pathway for transfer of knowledge and capability between different industries. We are already partnering with renewables for trials on tidal to allow us to lower our carbon footprint on offshore facilities. We work a lot with the composite Catapults on that, because they have been doing a huge amount with the automotive and aeronautical, so we are transferring technologies from them. The same with the manufacturing technology Catapults. The Catapults are a real catalyst to work with, because they work across industries and allow you to learn from what has already been invested in and to move that into your own industry and needs.

One of the things we talked about previously is that ultimately what we are learning at this stage, as we bring more and more technology into industry, is that ultimately it is bringing it back down into fundamental science. These challenges are not about being unique or about oil and gas: they are about rust, they are about heavy weight; they are about metallics; they are about heavy lift; they are about access; they are about data management; they are about digital. They are common to different industries and it is just making sure that we align as effectively as we can, share that learning. All you have to do, under specific rules or legislation, is make that technology fit your industry's needs.

Chair: We have another couple of questions and then we will be able to conclude this session.

Q113 **Christine Jardine:** I would like to move a step forward in the future and discuss the challenges and the opportunities that decommissioning presents to the oil and gas industry, where you think they are and how the technology we have talked about could drive it down, but also places like Nigg and decommissioning. We have talked a lot about the Aberdeen-centred face of the oil industry, but what about the other centres across the country and decommissioning? Specifically, what opportunities are there?

Colette Cohen: The National Decommissioning Centre, which we are creating right now with the University of Aberdeen, will have more a hub and spoke. In actual fact, we are creating a room very similar to this to allow us to be able to talk directly to other centres like Blyth, Fort William and Nigg so that they can be involved in conversations at the same time.



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I think it is important that you don't isolate. It should not just be about Aberdeen or Dundee or Nigg. It is about an industry and how effectively it can work. That is already at least starting. I do not think we feel isolated. It is just how effectively we can help connect each other that we are working on right now.

There is a big drive because of the OGA, and obviously Treasury, around trying to drive the costs down. We are looking at that right now, lots of technologies. It is quite challenging because ultimately to show a technology is working, how do you get the next version of a heavy lift when there might be one or two done a year, if that? It is a challenge to develop the technology and prove it and that is one of the things that we are working our way through.

The other part that we need to start addressing, both at a Government level and an industry level, is this concept that there is a decommissioning industry. There is not a decommissioning industry. That is like saying there is an exploration industry. Exploration to decommissioning is cradle to grave in our industry. As a result, decommissioning needs to be done hand in hand with the general activities of the oil and gas industry, and it is at its most effective when you are doing it while you have the skilled workforce and preferably the people who have the knowledge of the asset still around as part of the decommissioning activities, so we need to start integrating decommissioning into business as usual and stop trying to treat it as a separate activity. That is critical if we are going to bring the cost down and we are going to be effective.

Q114 Christine Jardine: Just briefly, some of the decommissioning is going to Norway. Deirdre Michie talked about how it is just a small proportion of the value of decommissioning. Would you think more investment is needed to keep decommissioning in this country and what impact could that have?

Colette Cohen: We need to look more at the way we do decommissioning and that comes back to the point that decommissioning needs to be part of the general activities. What goes to Norway, what goes to Holland or Singapore or wherever else is when you heavy lift. It is about 2% of the total value of the overall decommissioning costs. We are already very focused on 47% of the costs, which is the wells, lots of activity going on. We have three different technologies all being field trialled, multiple field trials on them looking at ways to reduce the costs around the well cost.

There is still that other 53% that is related to the facilities. How we do the facilities, we are very focused at the moment on heavy lift, on complete removal. There needs to be challenge on should we be on complete removal? How could we do parts of those decommissioning elements while we are still producing? There is a lot of conversation that still needs to be driven in the UK. That may result in some additional investment in the right places, but a lot of our facilities that we have—like



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Nigg and other ports—could take this if we treated it more as a bite-size salvage operation. There are opportunities there. We just need to discuss it. We do not have the solution yet.

Professor Kemp: I would add that all the issues relating to the decommissioning have been addressed in the UK far more than they have in other countries. In due course I think that the decommissioning activities are very exportable. That is not just doing all the physical work, but in my area, say in designing systems for financial security, potentially for the costs, a lot of other countries that have large oil industries have not scratched the surface on all the issues there. Residual liability, what happens to the remains? What should be done about that? These issues have all been addressed here. Some still have to come to fruition, but I know many countries where they have not addressed them, so it could be an exportable activity in the longer term.

Q115 **Christine Jardine:** Another area where we could export our expertise?

Professor Kemp: Yes.

Chair: I know Mr Reid is coming in, but we are almost out of time.

Willie Reid: A very short point.

Chair: Yes, very short then, Mr Reid.

Willie Reid: Very short, and that is that late life also is a very important part of pre-decommissioning and that we have skills in terms of asset integrity and development that complements that.

Q116 **Deidre Brock:** Of course, we do not have much time and this is kind of a big issue, but I wanted to ask—and the panel has touched on it at times during this session—how the sector balances the need for getting maximum amounts of economic return with the drive for a much lower carbon future, so I was wondering if you could tell us more about how the industry is creating a role for itself in the Clean Growth Strategy.

Colette Cohen: At this moment it is the larger operators. There are two ways of doing it. First, the sector deal has taken more of a strategic approach. That is why they are addressing the Underwater Innovation Centre, which combines skills and working hand in hand with renewables. The transformative technologies are looking specifically at technologies that would allow us to lower the carbon footprint and address the Clean Growth Strategy and the aspirations of both the UK and Scottish Governments, so you are getting that at an industry level.

I think you have individuals, particularly the larger operators, that have some very clear and quite aggressive goals of preparing themselves for a low-carbon future. They have put out those strategies and whether it is Dash Oil, BP, Shell, they all have very clear visions of where they would like to go and deliver as an oil and gas company in a low-carbon future, so there is work being done at different levels and in different areas of operations.



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Professor de Leeuw: If I could add, this is a good description of what plays out in the operator community. There is an equivalent agenda of course in the supply chain community and all the supply chain companies are already looking at diversifying their business. Putting a cable down or putting a pipeline down is very similar technology. Installing a platform and installing a windfarm, the installation itself is not dissimilar, so you can see diversification is already happening and as the market potentially for lower carbon and renewables business is growing, you can see the supply chain and the operator community are diversifying.

We need to be clear that there is a transition window. Oil and gas will play a hugely important role as we look at lower carbon transition, and we need to make sure that we support both industries in the right way to get the most value for the country.

Chair: I am going to have to leave it there. There are so many more questions, so many more issues to explore, but we are very grateful for your time. You have helped the Committee understand some of the key issues that we should be looking at as we go forward with this inquiry. As always, if there is anything that you observe about what we are considering and looking at and you feel you could contribute, please get back in touch with this Committee. We are grateful to you, Colette, for hosting us once again in this wonderful facility here up in Aberdeen, but thank you very much for attending today.